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RESEARCH ARTICLE

THE RELATION BETWEEN BODY MASS INDEX AND DIETARY HABITS, PHYSICAL ACTIVITY AND DURATION SPEND ON ELECTRONIC DEVICES IN CHILDREN (2-18) YEARS OLD IN ALMADINAH ALMUNWARRAH

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Abstract

Childhood obesity is one of the most serious public health challenges of the 21st century. type 2 diabetes mellitus, hypertension, and hypercholesterolemia are becoming more common among obese children. This study aimed to estimate the relation between body mass index and the dietary habits, physical activity and the duration spend on electronic devices among children in Almadinah, KSA.

Methodology: A community based Analytical cross-sectional study was conducted during the event of "Your Health is Your Life 6th Campaign" which was launched in Al Rashid Mall from 13-15/April/2017. Data were obtained based on self-filling questionnaire that included demographic, socioeconomic and lifestyle information. The body mass index was defined according to the Saudi growth charts of the ministry of health. data analysis was conducted and figured by using statistical analysis system (SAS) and Chi square tests were used to compare the result outcome variable with the studied independent factors.

Results: Out of the 78 participants in the study, 70% were girls while 29.4% were boys. Based on the Saudi growth charts for BMI for age most of children in our study have normal weight (60.25%) and underweight children were (23%) while the overweight and obese group were (16.5%). According to the investigated factors in the study, consumption of fast foods and dairy products were demonstrating extreme statistically significant also the frequency of eating fruits and vegetables, regular physical activity and using of electronic devices were significant as well.

Conclusion: Overweight and obesity during childhood are still remaining in increase. Dietary habits, physical activity and long duration using electronic devices are associated with increase the risk of obesity.

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Introduction:-

Childhood obesity is one of the most serious public health challenges of the 21st century, numerous psychological, physical and economic consequences of obesity are well known. Childhood obesity affects self-esteem and has negative consequences on the cognitive and social development. Conditions such as type 2 diabetes mellitus,

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hypertension, and hypercholesterolemia, which were noted primarily in adults, are becoming more common among children and may persist until adulthood lead to an increased risk of these conditions as well as of cardiovascular disease, osteoarthritis and certain types of cancer.^(1,2) The problem is global and is steadily affecting many low- and middle-income countries, particularly in urban settings. Previous decades have seen a significant rise in the world wide prevalence of childhood obesity. The percentage of children with obesity in the United States has more than tripled since the 1970s⁽²⁾. In Arab countries Obesity is high across all age groups a study performed to children in middle east reported that the highest prevalence of overweight was from Bahrain (38.5%), followed by Kuwait, (31.8%) and the lowest prevalence of obesity was found in the Islamic Republic of Iran (2%–3%) , followed by Lebanon (3.2%)⁽³⁾.

Today, about one in five school-aged children (ages 6–19) were obese. In Al-Madinah Al- Munawarah, children and adolescent aged 9 to 14 years the prevalence of obesity that (24.9%) of 197 children were obese and (15.2%) were overweight⁽⁴⁾. Among the genetic, parenting style and environmental factors that contribute to obesity and excess body fat⁽⁵⁾. Other risk factors also have been associated with CHO like lifestyle behaviors which include (physical activity, dietary habits, screen time, sleep duration), a study was done in 2016 among 9-11 years old British children discovered that sleep duration, physical activity and ST were significantly associated with overweight or obesity where no relevant relationship regarding the dietary score.⁽⁶⁾ Other study which also discussed lifestyle factors in Kuwaiti adolescents aged 14 and 19 years old found that eating habits in girls especially had more effect on the BMI variation and PA had greater effect on the BMI variation in boys. There was no significant relation between obesity and sedentary behaviors and television viewing.⁽⁷⁾

A recent study address the time children spent on electronic devices and its relation with BMI discovered that there were significant association regarding the increase in BMI and the use of electronic devices more than 2 hours daily.⁽⁸⁾ Other concern factor may be associated with CHO and overweight is the age or the timing of introduction of solid food, UNICEF and WHO recommend that the first 6 months of infants life should be exclusive breastfeeding and the introduction of adequate nutritional complementary feeding (food apart from formula milk, breast milk, tea and water) at 6 months with the continuous of breastfeeding until 2 years old.^(9,10)

A systematic review study conducted in 2013 found that the timing of initiation of solid food has no noticeable association with CHO though they suggest that the introduction at a very early age more than or at 4 months may increase body mass index of children.⁽¹¹⁾

Maternity employment has been a factor of interest in CHO although a study was done in Europe found there were no relationship between them.⁽¹⁵⁾

This study aimed to estimate the relation between body mass index and the dietary habits, physical activity and the duration spent on electronic devices among children in Al-Madinah Al- Munawarah, Saudi Arabia.

Objective:-

1. To determine the number of children from 2-18 years old who are overweight or obese.
2. To establish the most associated risk factors for childhood obesity.
3. To measure the awareness and concerns of caregivers about their child weight.

Subjects and Methods:-

Study design:

This is an Analytical cross-sectional study which was conducted during the event of "Your Health is Your Life 6th Campaign" in the period from 13/4/2017 till 15/4/2017 for two days, organized by Taibah Medical Club, Madinah, Saudi Arabia. The campaign was held in "Al-Rashid Mega Mall. The study was carried out among the children between 2 till 18 years old including both gender and their care giver in Madinah city, Saudi Arabia.

A predesigned structured Arabic language questionnaire was used in this cross-sectional survey. The questionnaires were distributed both manually and electronically on a large scale to get the effective sampling. The validity of the used Arabic questionnaire was obtained from discussions with an epidemiologist, family and community medicine consultants.

The confidentiality and privacy of the collected data were ensured through the use of anonymous questionnaire and during data entry and analysis. People were provided with information on the study aims and methods.

The questionnaire consisted of 23 questions about age, gender, nationality, educational level, residency (urban, rural), Anthropometrics data (weight, height and BMI). and there were questions about the care giver's nationality, educational level, job, family income and many questions related to their child diet habits, consumption of fast foods, physical activity and the duration spend on electronic devices. The sample size included 78 participants. The Saudi accounted for of 69.2 % of the sample and the non-Saudi were 30.8%.

Statistical analysis:

Descriptive and differential statistical measures were adapted for the analysis of the collected data using statistical analysis system (SAS). Data from questionnaires has been entered as numerical or categorical as appropriate. Data was presented using frequencies, mean and standard deviation as appropriate. Chi square tests were used to compare the studied outcome variable with the independent factors. The level of statistical significance was defined as p-value ≤ 0.05 .

Results:-

A cohort of 78 caregivers and their children were involved in this study. The mean age of the participated children was 8.29 ± 4.47 years. Regarding the gender, the females were more than males (55, 70.6% versus 23, 29.4%). The socio-demographic data was obtained and shown in Table 1.

Table 1:- Socio-demographic characteristics of the studied Children.

Characteristics*	N= 78 (%)
Age in years mean $\pm$ SD (range)	8.29 ± 4.47 (2-18 years)
Sex	
Male	23 (29.4%)
Female	55 (70.6%).
Nationality	
Saudi	51(65.4%)
Non-Saudi	27(34.6%)
Residence	
Urban	78 (100%)
Rural	0 (0%)
Level of school	
Not attending yet	32 (41.5%)
Primary	34 (43.5%)
Middle	8 (10%)
High	4 (5%)

Data are presented by mean $\pm$ SD or by n (%).

The mean $\pm$ SD of the anthropometric measures of the participated children are shown in Table 2, Figure 1. The BMI when analyzed in the studied children show statistical significance when compared with the normal international range.

Table 2:- The anthropometric measurements of the participated children

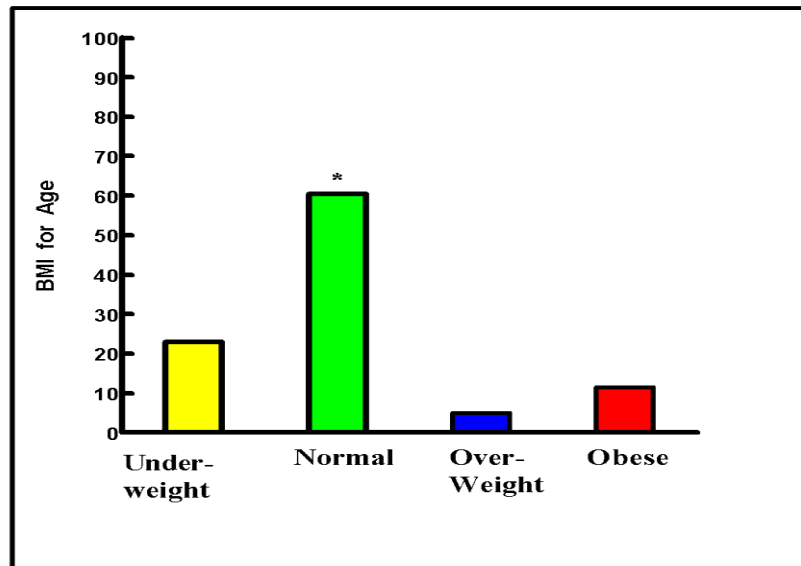
The anthropometric measurements *	N= 78, (range)
Children Weight in Kgs mean $\pm$ SD (range)	27.5 ± 13.27 , (range:10 - 67.2)
Children height in meter, mean $\pm$ SD (range)	1.25 ± 0.22 , (range: 0.85 - 1.68)
BMI of the studied Children, mean $\pm$ SD (range)	16.76 ± 3.59 , (range: 7.26 – 26.25) **

* Data are presented by mean $\pm$ SD (range)

** Considered Significant (two tailed p-Value)

However, BMI for age when plotted on the Saudi growth charts showed that most of the children in our study (47, 60.25%) have normal weight, underweight children were (18, 23%) and the group of (overweight/obese) children were (13, 16.5%).

Figure 1:- Distribution of the children in the study according to BMI for age.



The data of mothers in our study were shown in Table 3, most of the mothers (65.4%) were Saudi, with high level of education (high school and college level), 82% were unemployed. BMI of the participated mothers show statistical significance when compared to the normal international range.

Table 3:- Socio-demographic characteristics, anthropometric measurements of participated caregivers.

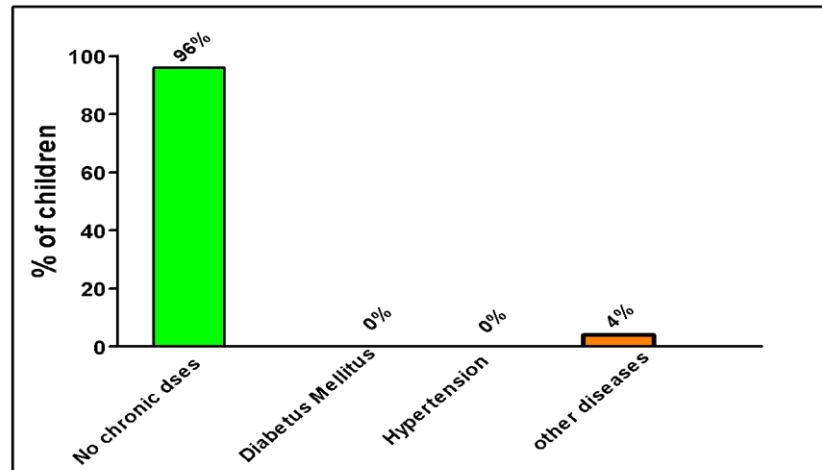
Characteristics*	N= 78 (%)
Nationality	
Saudi	51(65.4%)
Non-Saudi	27(34.6%)
Level of Education	
uneducated	2 (2.5%)
Primary school	8 (10.3%)
Middle school	10 (12.8%)
High school	23 (29.5%)
College	33 (42.4%)
Post-graduation	2 (2.5%)
Job	
Employed	14 (18%)
Unemployed	64 (82%)
income of the family / month	
2000 – 5000; Low income	37 (47.4%)
5000- 10000; middle income	26 (33.3%)
More than 10000	15 (19.3%)
Mother's Weight in Kgs, mean $\pm$ SD (range)	75.23 $\pm$ 18.84 (39 -155)
Mother's height in meter, mean $\pm$ SD (range)	1.57 $\pm$ 0.06 (1.44 – 1.75)
BMI of the participated mothers, mean $\pm$ SD (range)	30.67 $\pm$ 7.57 (13.49 – 61.31) **

* Data are presented by mean $\pm$ SD (range)

** Considered Significant (two tailed p-Value)

Furthermore, most of the children in our study (96.15%) is not suffering of any chronic diseases and not maintained on any long-term drugs. A non-significant ratio of children (4 %) is suffering from other diseases like asthma and other allergic conditions, see Figure 2

Figure 2:- Percentage of children suffering from chronic co-morbid diseases.



Most of the caregivers in the study (57, 73%) declared that weaning of their child was done after the age of 6 months, while (21, 27%) weaned their children before the age of 6 months. This was extremely significant (p-value < 0.0001).

The participating mothers were asked questions related to their children diet habits like consumption of fast foods, their children physical activity, and other life style activities, this was shown in Table 4.

Table 4:- Responses to the various statements.

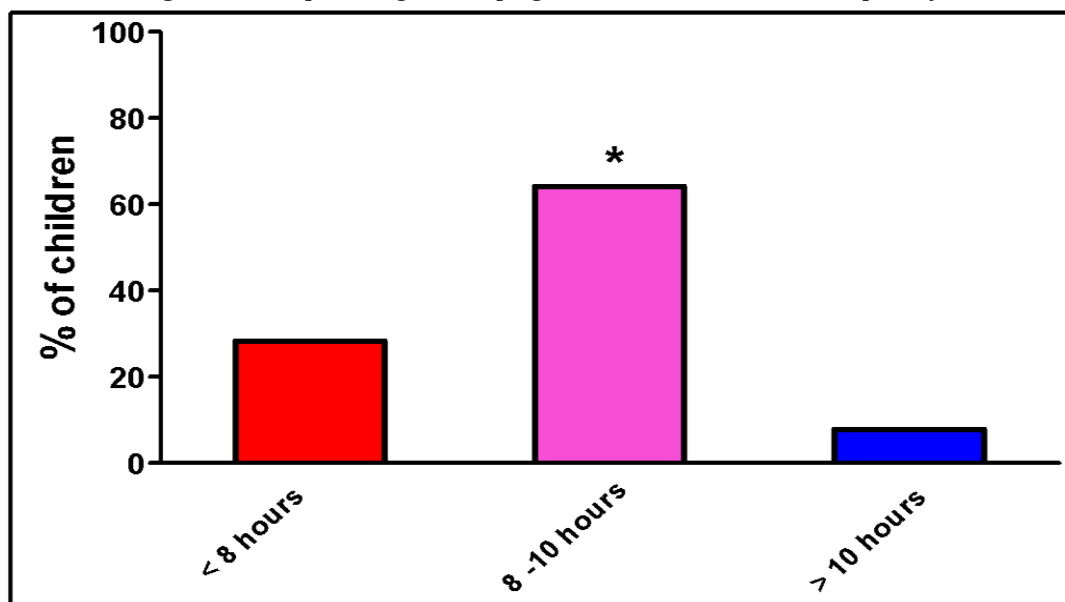
Statement	No.	%	Chi-square	P-Value
Does your child eat breakfast at home before going to school?				
Non	23	29.4	29.880	< 0.0001*
Sometimes	33 *	42.3 *		
Usually	4	5.2		
always	18	23.1		
How many times your child consumes fast food / week?				
Non	10	12.8	77.981	< 0.0001*
Once	36 *	46.1 *		
2-3 times	28	35.9		
4-5 times	3	3.9		
Daily	1	1.3		
How many times does your child consume junk food (like soda . potato chips , chocolate bars) / week ?				
Non	3	3.8	90.641	< 0.0001*
Once	41 *	52.5 *		
2-3 times	24	30.8		
4-5 times	9	11.6		
Daily	1	1.3		
How many times does your child eats vegetables and fruits / week ?				
Non	6	7.7	35.192	< 0.0001*
Once	21	26.9		
Once	31 *	39.7 *		

2-3 times	7	9		
4-5 times	13	16.7		
Daily				
How many times does your child drinks or eats dairy products / week?				
Non	3	3.9	99.455	< 0.0001*
Once	14	18		
2-3 times	11	14.1		
4-5 times	4	5.1		
Daily	46 *	59 *		
How many times does your child participate any physical activity program like (swimming, soccer , etc) / week ?				
Non	46 *	59 *	101.70	< 0.0001*
Once	16	20.5		
2-3 times	7	9		
4-5 times	1	1.3		
Daily	8	10.2		
How long does your child usually spend on each physical activity?				
Less than 30 minutes	45 *	57.7 *	33.577	< 0.0001*
30-60 minutes	12	15.3		
More than 60 minutes	21	27		

*Significantly different using chi-square test for independence ($P \leq 0.05$).

As regard the number of sleeping hours of the studied children per day, majority of children (50, 64.1%) sleeps 8-10 hours per day with statistical significance (p -value < 0.0001), while others (22, 28.2% and 6, 7.7%) sleeps Less than 8 hours Per day and More than 10 hours per day, respectively. Figure 3.

Figure 3:- The percentage of sleeping hours of the studied children per day.



There were significant differences regarding the time spend daily in front of electronic screens (either TV watching, playing video games or using smart phone) and time spend in practicing sport. About 68.1% of the studied children stay in front of screens on daily bases (more than 3 hours per day). While regarding practicing sports, 59% of the children are not practicing any type of sport per week, See Figure 4.

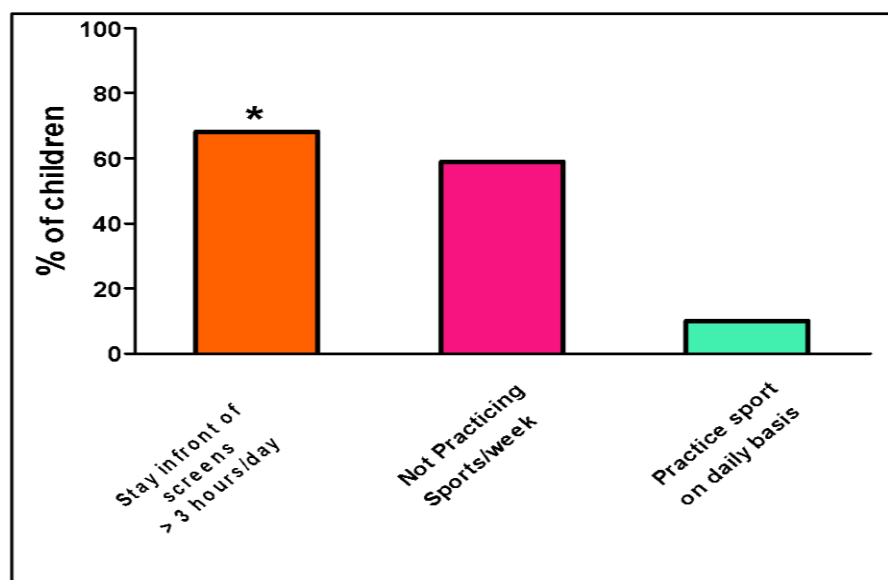


Figure 4:- The percentage of children who spend time daily in-front of electronic screens and who spend time in practicing sports.

When asking caregivers about what they consider their own weight, significantly about 53.8% think that they are overweight and very overweight (p -value < 0.0001). Only 43.5% of them consider their weight as normal.

On the other hand, when asking the caregivers about what they consider their child weight, only 10 mothers (12.8%) considered their children as overweight, while 37 mothers (47.4%) considered their children to have normal weight.

Table 5, shows the factors affecting the group of (overweight/Obese) children versus the normal weight children, we found that there was extreme significance between the two groups regarding

consumption of fast food/ junk food per week, and drinking/eats dairy products per week. Also, there were significance between both group when comparing with the factor (eating vegetables/fruits per week, participation in physical activity program per week, and time spend daily in front of electronic screens. While other factors do not show any significance.

Table 5:- Factors affecting the children body weight.

Factors affecting the children Body wt	Group normal wt (control)	Group overweight & Obese	Chi-square	P-Value
Gender: Female male	45 20	10 3	0.04933	0.8242
Starting weaning: Before 6 months After 6 months	31 34	3 10	1.762	0.1843
Eat breakfast at home before going to school None Sometimes	46 19	8 5	0.1083	0.742
Consumption of fast food or junk food None 1-3 times/week	53 12	1 12	24.375	$< 0.0001^{**}$
Eating vegetables, fruits / week?			7.212	0.0072 *

None	17	9		
2-5times/week	48	4		
Drinking or eats dairy products/week?			15.511	< 0.0001**
None	12	10		
2-5times/week	53	3		
Participation in physical activity program / Week			5.908	0.0151*
None or once/week	28	11		
2-5times/week	37	2		
No. of sleeping hours			0.8357	0.3606
Less than 8 hrs	32	4		
More than 8 hrs	33	9		
Time spend daily in front of electronic screens			5.516	0.0188*
2-4hrs	41	3		
> 6 hrs	24	10		
BMI of mothers			3.157	0.0756
Less than 30	49	6		
More than 30	16	7		

*Significantly different using chi-square test for independence (with Yates correction) ($P \leq 0.05$).

**Extremely significant

Discussion:-

During a health awareness campaign 78 caregivers and their children of Madinah Region were enrolled in this study to assess the most associated risk factors for childhood obesity as well as to measure the awareness and concerns of caregivers about their child weight.

The prevalence of childhood obesity has increased in the past years worldwide. This study revealed that 16.5% (n=13) of the participants children have obesity, this percentage was lower than a previous study (conducted on 197 primary-school children aged 9 to 14 years living in Al-Madinah Al- Munawarah city. Stated that the prevalence of childhood obesity is 24.9%⁽⁴⁾

This study reveals that being physically active were associated with lower BMI, these findings are consistent with the other study discussed lifestyle of these age groups shows that engaging in physical activities can assist in healthful weight control behavior. Also, a significant increase risk of being overweight were associated with increased consumption of the fast food. Both studies also showed that there is no significant difference for consumption of breakfast and obesity⁽⁷⁾.

Also found the longer time spent on electronic devices was significantly associated with increased in body mass index.^(6,8) and there was no correlation between sleep duration and introduction of solid food in infancy with the risk of overweight or obesity in children's Even though these results differ from previous study^(6,10).

The most striking result emerge from the data is the less consumption of dairy product, fruit and vegetables was significantly linked to increase in BMI in children.

Study Strengths:

Conducting this study in a public place (Al-Rashid Mega Mall, Madina) for three days, and our visits from every part of the city, with different backgrounds, and different socioeconomic statuses. The participants were interviewed, and their height and weight (BMI), were measured by trained medical and paramedical students who filled out the questionnaires. The collected data was analyzed using the technology of IBM SPSS.

Study Limitations:

we are aware that our research has two limitations the first was the small sample size and the second was limited numbers of research that did not emphasize the effect of each food groups on body mass index of children

Conclusion:-

Overweight and obesity during childhood are still remaining in increase. Dietary habits, physical activity and long duration using electronic devices are associated with increase the risk of obesity

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